Student Reports of Affective Variables While Completing Electronic Homework (Maple T.A.)

Robert Cypher & Dr. Chris Hlas ✦ Mathematics ✦ University of Wisconsin- Eau Claire

I. Flow

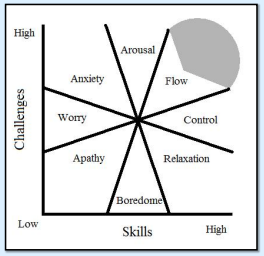
Flow theory describes the optimal human experience; during such experiences a person is performing to the utmost of their ability. Flow experiences occur when a person's attention is focused on a particular task, and is not distracted by influences outside of the activity at hand. Due to the powerful nature of flow experiences in the areas of motivation and learning, it is important to investigate connections between educational practices, like the use of Maple T.A.

Conditions of Flow

Research has shown that flow experiences occur under a specific set of conditions. These conditions include the balance of a person's ability to act and the available opportunities for action.

- Challenges
- Skills

When the challenge of an activity and the participants skills are both high, the possibility of experiencing flow is increased.



In addition to this balance between Challenge and Skill, all activities which produce flow are characterized by some or all of the following properties:

Activity Dependent Properties	Activity and Participant Dependent Properties
• Possibility of completion	• Ability to concentrate
• Clear goals	**Concentration Dependent Properties**
• Immediate feedback	• Removes awareness of everyday worries
• Sense of control over personal action	• Loss of sense of self
	• Time is altered

II. Maple T.A.

Maple T.A. is a web-based system for creating homework assignments. There are two main properties of Maple T.A. assignments which differ from traditional paper and pencil assignments.

•Immediate External Feedback- Upon completing a Maple T.A. assignment students are given immediate access to the score and the correct responses for the assignment

•Consistent Level of Challenge- Teachers can choose to allow students to complete Maple T.A. assignments multiple times. Each subsequent assignment is the same level of difficulty as the preceding assignment.

These properties make Maple T.A. special compared to previously used homework methods. Maple T.A. seems to contain all of the activity dependent characteristics of a flow activity, more so than traditional paper and pencil forms of mathematics homework, which implies that Maple T.A. should be a better flow activity. This reason and the lack of previous research into electronic assessments like Maple T.A., has led to this research.

III. Method

•Sample- 27 of 30 Calculus I students in Dr. Chris Hlas's Class

•Time- 6 weeks during Fall Semester 2009

•Data Collection- One survey is imbedded randomly in each Maple T.A. homework assignment. Assignments were given twice a week and students were able to complete each assignment a maximum of 5 times.

•Survey Content- Surveys gather student reports of Challenge and Skill variables, as well as data related to the time and place of assignment completion.

•Survey data:

- Participants completed an average of 22.8 surveys each ($\sigma = 11.33$).
- 619 surveys were attempted out of 767 (80.7%) assignments.
- 549 surveys (88.6%) were complete.

Possible Biases

- The sample is drawn from Dr. Hlas's class, who has researched Flow Theory in the past. It is not possible to know how this influences his teaching and in turn how it has influenced student responses.
- The transition to the new version of Maple T.A. involved some difficulty which may have affected student perceptions of Maple T.A. assignments.

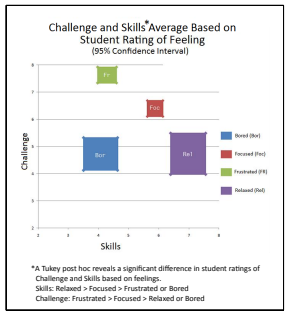
Sample Survey

On the scale of 1-10 (1 being low, 10 being high), how challenging is this problem?
On the scale of 1-10 (1 being low, 10 being high), how skilled are you with this type of problem?
Did you enjoy this problem?
Which of the following words best describes your feeling toward this problem?
o Bored o Focused o Frustrated o Bored
Was it difficult to keep your mind on this problem?
Do you feel that you have given yourself sufficient time to complete this problem?
On what day of the week are you completing this assignment?
At what time are you completing this assignment?
Where are you working on this assignment?
On a scale of 1-10 (1 being low, 10 being high) how distracting is the surrounding environment?
How many times have you taken this particular assignment?

Resources

- Csikszentmihalyi, M (1997). *Finding Flow: The Psychology of Engagement with Everyday Life*. New York, NY: Basic Books.
- Csikszentmihalyi, M (1990). *Flow: The Psychology of Optimal Experience*. New York, NY: Harper Perennial.
- "Maple T.A.." Maplesoft, Web. 19 Jan 2010. <http://mapleta.apps.uwec.edu:8080/mapleta/login/login.do>.

IV. Results



ANOVA Results

	df	Mean Square	F	Significance
Challenges	3		38.005	.000
Within Groups	545	5.243		
Skills	3		36.398	.000
Within Groups	545	4.567		

ANOVA Conclusions

- ❑ The student reports of feelings fit the pattern of Challenges and Skills predicted by Flow Theory
- ❑ Relaxed students rated their skill higher than Focused students
- ❑ Frustrated students rated the challenge higher than Focused students.

Correlation Results

❑ Enjoyment
- •with Challenge (-.411)
- •with Skill (.224)

❑ Skills
- •with Challenge (-.277)
- •with Correct Responses (.176)
- •with Assignment Scores (.226)

❑ Note: The Pearson correlation coefficients are at least at the 99% confidence level.

Correlation Conclusions

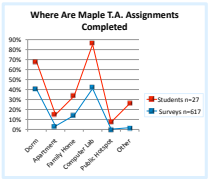
- ❑ The negative correlation between Challenge and Skill is the opposite of the desired correlation. Flow is most likely to occur when both challenges and skills are high.
- ❑ The negative correlation between Challenge and Enjoyment is significant.

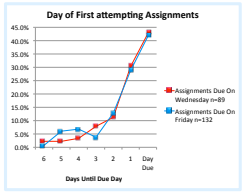
Possible Interpretations

I. Challenges are growing too fast for most students
II. Students feel a lack of control regarding the challenge level

Time and Location Data

- •There is no significant difference in student rating of distraction level based on location
- •The average time of day for assignment completion is 3-5 pm (at 99% confidence level) Note: Assignments are due at 5 pm.





Conclusions

- Students are doing their assignments according to the professors timetable
- The availability of on-campus computing resources is important

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